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*REPORT TO THE CONGRESS*

72-0158



Improved Production Cost Data  
For Individual Nuclear  
Weapon Systems  
To Be Provided To The Congress By  
The Atomic Energy Commission B-1651

*BY THE COMPTROLLER GENERAL  
OF THE UNITED STATES*

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FEB. 29, 1972



COMPTROLLER GENERAL OF THE UNITED STATES  
WASHINGTON, D.C. 20548

B-165546

To the President of the Senate and the  
Speaker of the House of Representatives

This is our report on improved production cost data for individual nuclear weapon systems to be provided to the Congress by the Atomic Energy Commission. 713

Our review was made pursuant to the Budget and Accounting Act, 1921 (31 U.S.C. 53), and the Accounting and Auditing Act of 1950 (31 U.S.C. 67).

Copies of this report are being sent to the Director, Office of Management and Budget, and to the Chairman, Atomic Energy Commission.

A handwritten signature in black ink that reads "James B. Stacks".

Comptroller General  
of the United States

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ABBREVIATIONS

AEC	Atomic Energy Commission
ALO	Albuquerque Operations Office
DOD	Department of Defense
GAO	General Accounting Office

D I G E S T

WHY THE REVIEW WAS MADE

The General Accounting Office (GAO) reviewed the procedures and practices used by the Atomic Energy Commission (AEC) and its weapons production contractors to account for the costs of producing nuclear warheads and bombs for the Department of Defense. GAO wanted to determine whether these procedures and practices resulted in reasonably accurate information as to the cost of producing individual weapon systems.

FINDINGS AND CONCLUSIONS

In developing, testing, and producing weapons, AEC expended about \$828 million in fiscal year 1971, of which about \$359 million was for the production and maintenance of nuclear weapons. (See p. 3.)

As a means of improving control over weapons production costs, AEC has adopted a standard cost accounting system. Under this system AEC's weapons production contractors are responsible for controlling the costs incurred in the production of nuclear weapons. (See pp. 4 and 5.)

AEC advised us that, although its standard cost accounting system was not designed to accumulate production costs by weapon system, such costs were computed for use in supporting AEC's budget estimates. (See p. 5.)

In support of its annual budget requests, AEC routinely estimates the costs for individual weapon systems for the particular budget year. In addition, AEC periodically computes total cumulative production costs of weapon systems for years prior to the budget year and estimates future production costs (See p. 6.)

The production costs for each weapon system delivered during the year, as computed by AEC, represent the standard costs of the system adjusted for a share of the variance between total standard costs and total production costs incurred during the year for all weapon systems. AEC assigns a share of the total variance to each weapon system on the basis of a uniform percentage, regardless of the variance experienced in producing each system. (See p. 6.)

Under this method of assigning the cost variance, the costs attributable to each weapon system by AEC can be distorted significantly. For example, the unit costs incurred by one contractor during fiscal year 1970 for its part a warhead were more than the total unit costs that AEC attributed to the production of the entire warhead for the year. (See p. 9.)

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When requested by the Congress, AEC has provided estimates of the total costs of producing individual weapon systems. Because of the manner in which AEC assigns the cost variance to individual weapon systems, these estimates do not provide an adequate basis for identifying cost growth which may have occurred on such systems. (See p. 6.)

AEC should revise its method of computing the costs of individual weapon systems to assign the cost variance between standard costs and costs incurred more accurately to each weapon system. In support of its budget requests, AEC should also provide the Congress annually with cost information on the production of individual weapon systems. (See p. 11.)

#### RECOMMENDATIONS OR SUGGESTIONS

AEC should:

- Improve its procedures for assigning cost variances to individual weapon systems to provide for the development of more accurate information on the cost of producing each weapon system.
- Provide the Congress annually, from the time funds are first requested for the production of a weapon system, with information as to (1) cumulative production costs, (2) estimated future production costs, (3) previous production costs estimates, and (4) pertinent comments explaining any significant differences between current and prior cost estimates. (See p. 11.)

#### AGENCY ACTIONS AND UNRESOLVED ISSUES

AEC agreed with GAO's recommendations and plans to take appropriate steps to implement them. (See p. 11.)

#### MATTERS FOR CONSIDERATION BY THE CONGRESS

The improved production cost data to be provided by AEC should be of assistance to the Congress, in view of the interest expressed by its committees and members in the cost of weapon systems.

## CHAPTER 1

### INTRODUCTION

The Atomic Energy Commission produces nuclear warheads and bombs in accordance with technical requirements and time schedules specified by the Department of Defense (DOD). To provide the nuclear weapons required by DOD, AEC maintains a weapons production complex which includes eight AEC-owned, contractor-operated production facilities. With the exception of a cost-plus-incentive-fee arrangement for one plant, the plants are operated under cost-plus-fixed-fee contracts.

Work performed at the production facilities includes development support work for AEC's weapons research laboratories; production of experimental, prototype, or stockpile weapon components and nuclear warheads and bombs; assembly, modification, or retirement of these weapons; and certain special projects performed for DOD on a reimbursable basis. A substantial part of the contractors' work is devoted to quality control and the development of manufacturing processes for the weapon systems.

In carrying out its responsibilities for developing, testing, and producing weapons (except for special projects performed for DOD), AEC expended about \$828 million in fiscal year 1971, of which about \$359 million was for the production and maintenance of nuclear weapons.

Our review was conducted at AEC Headquarters, Germantown, Maryland; AEC's Albuquerque Operations Office (ALO), Albuquerque, New Mexico; AEC's Oak Ridge Operations Office and Y-12 plant, operated by the Union Carbide Corporation-Nuclear Division, Oak Ridge, Tennessee; and AEC's Kansas City Area Office and Kansas City plant, operated by the Bendix Corporation-Kansas City Division, Kansas City, Missouri.

The contents of this report have been discussed with representatives of AEC, and their comments have been incorporated into the report.

The Division of Military Application at AEC Headquarters has the overall responsibility for the direction of AEC's

weapons program. ALO has been (1) delegated budgetary and production control responsibility for the weapons production complex and (2) given the responsibility for scheduling, quality assurance, and other aspects of weapons production.

The Manager of ALO is administratively responsible to the General Manager of AEC. In carrying out its weapons production responsibilities, however, ALO receives programmatic direction from the Division of Military Application.

The Office of the Controller at AEC Headquarters is responsible for the development and maintenance of AEC's financial management program, including the policies, procedures, and standards of accounting, budgeting, and related reporting that are considered essential for the management of AEC and contractor operations. The Controller (1) furnishes those responsible for AEC operations with reports on costs, pricing, and other matters that are needed for management and (2) formulates the policies and principles for the accounting, reporting, and control of product costs and inventories of weapon components, as well as for other AEC programs.

A completed weapon comprises many parts which are produced and assembled by the production contractors. Two of AEC's eight production plants have been designated as final assembly plants. AEC has advised us that each production contractor is responsible for controlling the costs that it incurs in the production and assembly of these parts. The results of the contractor operations are reported to ALO.

AEC advised us that, prior to July 1964, it prescribed cost accounting principles and procedures to be followed by each weapons production contractor in costing weapons production. AEC advised us also that, for the cost data it required, the contractors were permitted to develop such data from their own cost accounting systems, subject to AEC approval.

On December 9, 1963, the AEC General Manager directed that a standard cost accounting system be developed for costing weapons production. The directive provided that, as of July 1, 1964, each weapons production contractor adopt

a standard cost accounting system, under policies and principles prescribed by AEC, as a means of improving the control of weapons production costs. Instructions issued by the AEC Controller to implement the General Manager's directive cited the following objectives of the standard cost system.

1. Control and reduction of costs by means of more effective accounting, engineering, and budgeting techniques.
2. Promotion and measurement of the efficiency and adequacy of contractors' production performance.
3. Simplification of costing procedures.
4. Evaluation of inventories.
5. Highlighting of areas requiring immediate managerial action.

AEC has advised us that, although all these objectives have significant value, the major purpose of the standard cost accounting system is to provide a basis for the control of production costs of parts and components as they are procured, fabricated, and assembled. Cost standards are established for each weapon part or component on the basis of engineering studies and projected system work loads. AEC advised us also that its contractors controlled costs by ascertaining periodically the causes of major cost variances and by taking corrective action.

AEC advised us further that, although its standard cost accounting system was not designed to accumulate production costs by weapon system, such costs were computed for use in supporting AEC budget estimates and that, upon request, such cost data was provided to the Congress. AEC computes the cost of individual weapons by allocating a share of the total cost variance for a year to the costs of the individual weapon systems delivered during that year. The total cost variance is the difference between the total production costs incurred and the total standard costs of all weapon systems components produced.

## CHAPTER 2

### DEVELOPMENT OF PRODUCTION COSTS OF WEAPON SYSTEMS

In support of its annual budget requests, AEC routinely estimates the costs for individual weapon systems for the particular budget year. In addition, AEC periodically computes total cumulative production costs of weapon systems for years prior to the budget year and estimates production costs to be incurred subsequent to the budget year. The production costs for each weapon system delivered during the year, as computed by AEC, represent the standard costs of the system, adjusted for a share of the variance between total standard costs and total production costs of all weapon systems. AEC assigns a share of the total variance to each weapon system on the basis of a uniform percentage, regardless of the variance experienced in producing each system.

Our review showed that, under this method of assigning the variance, the costs attributed to each weapon system by AEC could be distorted significantly. For example, the unit costs incurred by one contractor during fiscal year 1970 for its part of a particular warhead were more than the total unit costs that AEC attributed to the production of the entire warhead for the year.

When requested by the Congress, AEC has provided estimates of the total costs of producing individual weapon systems. Because of the manner in which AEC assigns the cost variance to individual weapon systems, these estimates, in our opinion, do not provide an adequate basis for identifying cost growth which may have occurred on such systems.

The Congress has expressed considerable interest in cost growth of national defense projects and, specifically, in AEC's costs of producing its part of nuclear weapon systems. We believe that AEC should revise its method of computing the costs of individual weapon systems, to assign more accurately the variance between standard costs and costs incurred to each weapon system. We believe also that AEC, in support of its budget requests for production funds for each weapons system, should provide the Congress annually with information as to cumulative production costs,

estimated future production costs, previous production cost estimates, and pertinent comments explaining any significant differences between current and prior cost estimates. AEC advised us that the accumulation of such cost information would not require a major additional effort.

PREPARATION AND USE OF PRODUCTION COST ESTIMATES FOR INDIVIDUAL WEAPON SYSTEMS

In September 1967 AEC prepared an initial estimate of the total costs to develop and produce the warheads for the SENTINEL (now SAFEGUARD) anti-ballistic-missile system. Prior to the initiation of planning for the anti-ballistic-missile system, AEC generally did not prepare total cost estimates for developing and producing its part of nuclear weapon systems. In September 1969 AEC prepared cost estimates for all major systems in the development engineering or production phases.

In April 1970, during the hearings on AEC's fiscal year 1971 budget, a subcommittee of the House Committee on Appropriations requested that AEC provide it with cost estimates for nuclear weapon systems then in production and for systems that were planned for production in the near future. These cost estimates were prepared by AEC on the basis of cost data supplied by its contractors involved in the development and production of nuclear weapon systems.

In a memorandum dated May 15, 1970, AEC requested its field locations to submit cost estimates semiannually, so that it could update the estimated cost of each weapon system. The AEC memorandum stated that:

"\*\*\* Due to the number of inquiries we have had for this information, we now find it necessary to update these estimates periodically and to maintain them on a current basis \*\*\*."

AEC COMPUTATION OF WEAPON SYSTEMS'  
COSTS BASED ON STANDARD COSTS

Nuclear weapons manufactured and delivered each year are valued by AEC at the standard cost established for each unit, adjusted for a part of the total cost variance reported by all production contractors. Under AEC's method of allocating the cost variance, the production costs assigned to each weapon system for a given period may be substantially different from the costs incurred because the total cost variance is allocated to each weapon system delivered during the year on the basis of the average cost variance percentage for all systems in production.

Development of standard costs

Each weapons production contractor develops standard costs annually for the parts scheduled to be manufactured for new weapons. Standard costs of each part consist of direct labor costs, direct material costs, and indirect costs.

Standard direct labor costs and direct material costs generally are developed by an analysis of production requirements in terms of fabrication time and the application of known or expected wage rates, and the amount of materials needed and known or estimated material costs, respectively. Standard indirect costs generally are (1) developed through an analysis of such factors as projections of work load, wage and salary rates, and manpower requirements and (2) charged to the parts on the basis of standard direct labor hours developed for the part. Thus the standard cost of a part is the total of direct labor costs, direct material costs, and indirect costs. The standard cost of a completed weapon is the total of the standard cost developed for the manufacturing and assembling of the various parts that make up the weapon.

Computation of weapon costs

In computing weapon system unit costs, AEC assigns a share of the total variance to each weapon system on the basis of a uniform percentage, regardless of the variance experienced in producing the system.

To illustrate the manner in which AEC computes weapon system unit costs, a hypothetical example is presented below to avoid the use of classified information. AEC considers the production costs for individual weapon systems classified information.

Weapon system	Standard unit cost					Number of units delivered	Total standard cost
	Plant A	Plant B	Plant C	Plant D	Total		
X	\$10	\$20	\$30	\$40	\$100	10	\$1,000
Y	<u>20</u>	<u>40</u>	<u>60</u>	<u>80</u>	<u>200</u>	<u>15</u>	<u>3,000</u>
Total	<u>\$30</u>	<u>\$60</u>	<u>\$90</u>	<u>\$120</u>	<u>\$300</u>	<u>25</u>	<u>\$4,000</u>

If the total production costs incurred during the period were \$6,000 and if the total standard costs for that production were \$4,000, a part of the \$2,000 cost variance would be allocated to each weapon system delivered. The amount of cost variance allocated to each system would be 50 percent (\$2,000 divided by \$4,000) of its standard cost, regardless of the weapon systems for which the cost variances were applicable.

Production costs for each weapon system would be computed by AEC as follows:

Weapon system	Standard unit cost	Plus 50-percent cost variance	Total cost per unit	Number of units delivered	Total actual costs
X	\$100	\$ 50	\$150	10	\$1,500
Y	<u>200</u>	<u>100</u>	<u>300</u>	<u>15</u>	<u>4,500</u>
Total	<u>\$300</u>	<u>\$150</u>	<u>\$450</u>	<u>25</u>	<u>\$6,000</u>

The method of computing weapon system costs would not show, except perhaps coincidentally, the costs incurred in producing new units, because the method involves using the same percentage of standard cost to allocate the cost

variance to each weapon system. For example, with respect to the initial production of a warhead, one contractor's unit cost report for fiscal year 1970 showed a cost variance of about \$182,000 above standard costs. Because the total cost variance for the weapons production complex is allocated to the various weapon systems on the basis of the same percentage of standard costs, the cost variance assigned by AEC to the completed warhead was about \$72,000 above standard costs.

The distribution of the \$72,000 cost variance to the warhead resulted in a total unit cost which was about 8 percent lower than the costs reported by the contractor for its part of the warhead alone, even though the contractor's standard cost accounted for a relatively small percentage of the total standard cost of the completed warhead.

In commenting on this matter, AEC advised us that:

"The variance was due primarily to reduced efficiency and production associated with starting up the plant and realigning the learning curve upon the termination of a long and costly strike. The production costs incurred in succeeding quarters for this component exceeded the standard by relatively minor amounts. Furthermore, these post-strike conditions affected the entire weapons complex and since no one of the various components should absorb the strike-related costs, these cost variances were allocated to all systems delivered to war reserve in fiscal year 1970."

## CONCLUSIONS

AEC spends substantial amounts in producing its part of nuclear weapon systems. Congressional committees have expressed interest in the costs incurred by AEC for this purpose. For example, in AEC's fiscal year 1971 appropriation hearings before a subcommittee of the House Committee on Appropriations, the subcommittee inquired into whether cost overruns were expected to occur on two particular systems and specifically requested current cost estimates for each weapon system in production or planned for production in the near future.

We believe that AEC should revise its method of computing the costs of individual weapon systems to assign more accurately the variance between standard costs and costs incurred to each weapon system. We believe also that AEC, in support of its budget requests for production funds for each weapon system, should provide the Congress annually with information on cumulative production costs, estimated future production costs, previous production cost estimates, and pertinent comments explaining significant differences between current and prior cost estimates.

#### RECOMMENDATIONS

We recommend that AEC improve its procedures for assigning cost variances to individual weapon systems to provide for the development of more accurate information on the cost of producing each weapon system. We recommend also that, from the time funds are first requested for the production of a weapon system, AEC provide the Congress annually with information as to (1) cumulative production costs, (2) estimated future production costs, (3) previous production cost estimates, and (4) pertinent comments explaining any significant differences between current and prior cost estimates.

In commenting on our report, AEC points out that its standard cost accounting system meets the needs of management in controlling weapons production costs as they are incurred. AEC stated that it agreed with our recommendations and planned to (1) develop supplementary information which will better identify cost variances applicable to individual weapon systems for budgetary purposes and (2) explain any significant differences between estimates of total systems costs that are furnished to the Congress.



